MD IMMUNO HEAMATOLOGY & BLOOD TRANSFUSION

[Syllabus Approved by Board of Studies, Medical & Health Sciences]

Programme Code	HLTH09A08
Programme Details	MD IMMUNO HEAMATOLOGY & BLOOD TRANSFUSION
Programme Learning Outcomes (PLOs / PSOs)	ANNEXED IN THE BELOW FORMAT
Eligibility Criteria	**AS PER NMC NORMS**
Duration of the Course	3 YEARS
Programme Structure (Credit-Based)	NA
Detailed Course Syllabus	ANNEXED IN THE BELOW FORMAT
Teaching–Learning Methodologies	3 YEARS RESIDENCY PROGRAM
Examination & Evaluation System	ANNUAL APPRAISALS FOLLOWED BY FINAL YEAR EXAMINATION AS PER NMC NORMS
Internship / Project / Dissertation Guidelines	1 YEAR MANDATORY BOND
Program In Charge	HEAD, DEPT OF TRANSFUSION MEDICINE

M.D. (IMMUNO-HEMATOLOGY & TRANSFUSION MEDICINE)

Programme Code: HLTH09A08

Programme Outcome:

- The goal of postgraduate medical education in Immunohaematology & Blood Transfusion shall be to produce competent specialist.
    - Who shall recognize the health needs of the community and carry out professional obligation ethically and in keeping with the objectives of the national transfusion policy.
    - Who shall have mastered most of the competencies, retaining to the speciality that are required to be practiced at the secondary and tertiary levels of the healthcare delivery system.
    - Who shall be aware of contemporary advances and developments in the discipline of IH & BT.
    - Who shall have acquired a spirit of scientific inquiry and oriented to the principles of research methodology and epidemiology.
    - Who shall have acquired the basic skills in teaching of the medical and paramedical professionals.
    - Organize health team's / transfusion camps to provide care during natural or man-made calamities.
- At the end of the course a candidate must be able to:
    - Understand and explain the basis of pretransfusion testing.
    - Should be able to explain and diagnose the adverse effects of blood transfusion.
    - Should be able to perform apheresis technique independently.
    - Should be able to carry out the antenatal and neonatal transfusion practice.
    - Should be able to plan, perform and report specific research projects.
    - Should be able to give advice on chemotherapy including stem cell transplantation and solve the immune hematological discrepancies in blood transfusion
    - To understand and advise on the rationale and process of use of blood & blood products to the associated clinical faculty.

PROGRAMME CIRRICULUM

DURATION OF COURSE:

The minimum period of training shall be three calendar years and the candidates can be admitted to this training after their full registration with the Medical Council. No exemption shall be given from this period of training of three years either for doing housemanship or for any other experience or diploma.

TRAINING PROGRAMME:

The candidates joining the course must work as full time residents during the whole period of their postgraduate training. They will be required to attend a minimum of 80% of training period. Candidate shall be given full time responsibility and assignments and their participation in all facets of the educational process assured. Postgraduate students must maintain a record book of the work carried out by them and the training undergone by them during the period of training. These record books shall be checked and assessed by the faculty.

TEACHING / LEARNING METHODS:

Learning in M.D. (Immunohematology & Blood Transfusion) will essentially be self-learning.
Following teaching-learning methods shall be followed:

- **Group teaching sessions:**
  - Journal review
  - Subject seminar presentation
  - Group discussion
  - Clinical case presentations pertaining to transfusion therapy.
  - Presentation of the findings of an exercise on any of the sub-specialities
  - Participation in CME programs, conferences and workshops.

Hands on experience (practical training)

Practical training shall be imparted by posting the students in various sub-specialties (sections) as detailed in the intrinsic and extrinsic rotation. Students shall be actively involved in day to day working of all the sections.

He/She will be trained under the guidance of teachers in all the aspects of practice of transfusion therapy and basic blood banking techniques including blood collection processing, storage of blood components, component preparation, pre-transfusion testing, apheresis, screening of blood products and haemotherapy including stem cell transplantation and all emergencies related to Blood Banking.

Suggested schedule of rotation (33 months):

Intrinsic rotation:

The candidates will be rotated through various sections of the department as under:

- **Blood donor management** **(6 months)**
  - Donor counseling, recruitment & motivation
  - Blood Donor selection
  - Phlebotomy
  - Post donation care of donor
  - Outdoor blood donation camps
  - Adverse donor reaction identification and management

- **Component preparation, Apheresis & Quality Management** **(8 months)**
  - Preparation of various blood components
  - PRBC, FFP, platelet concentates, Cryoprecipitate, leukoreduced/ leukodepleted blood components
  - Irradiation of blood components
  - Storage & quality control
  - Apheresis
  - Donor apheresis
  - Therapeutic plasma exchange/ Theraputic Aphersis
  - Granulocytapheresis

- **Transfusion transmitted infection screening** **(5 months)**
  - Screening of various markers: HIV, HCV, HBsAg, Syphilis, Malarial Parasite
  - Methodology: ELISA, Spot, Rapid, Automated analyzer
  - Molecular techniques

- **Immunoheamatology** **(6 months)**
  - Diagnosis & Transfusion support in
    - AIHA
    - PNH
    - Transfusion reaction

  - Antenatal serology
  - Multi – transfused patients

- Secretor status
- Minor red cell antigen typing
- Antibody screening and identification
- Advance Immunohematology

- **Pre transfusion testing & Cross matching (6 months)**
  - ABO grouping & Rh typing
  - Weak D testing. Genotyping
  - Irregular antibody screening & identification
  - Cross – matching techniques
  - Problem crossmatch/ Incompatible crossmatch workup

- **Quality control / computers / records (1 months)**

- **PBSCT, Umbilical cord stem cells Bone marrow stem cells (1 months)**
  - PBSC- Donor assessment and counselling
  - Harvest
  - CD 34 counts
  - Cryopreservation
  - Quality Control

Training in Allied departments

- **Dept of Pathology / Haematology (1/2 months)**
  - Complete haemogram
  - Reading of peripheral smear
  - Coagulation work up
  - Hemolytic Anemia work up
  - Bone – marrow smear – Aspiration & Trephine
  - Hematological disorders – work up
  - Flowcytometry
  - Isolation of lymphocytes

- CD4 / CD8 counts
- Special molecular techniques

- **Dept of Microbiology & Virology** **(1/2 months)**
  - Western Blot, PCR
  - Blood culture- Aerobic, Anerobic, Fungal
  - Grams staining

- **Dept of Anesthesiology** **(1/2 months)**
  - Residents may undergo rotation in various OTs
  - Including specialized OT's
  - Intra-operative haemodilution
  - Blood salvage
  - Intra-operative transfusion

- **Dept of Clinical Haematology & BMT** **(1/2 months)**
- **Advanced Training in Immunohaematology** **(1/2 months)**
- **HLA Typing Immunofluoresence** **(1/2 months)**

- **Grand Total** **(36 months)**

- **Clinical Department, Subject**
  - Transfusion support for thalessemia, hemophilia, hemato-oncology patients
  - Bedside management of transfusion reactions
  - Bedside management of transfusion in AIHA patients
  - Bedside transfusion support in BMT patients
  - Bedside transfusion support in Medical Emergencies

- **Emergency duty:**

  Student shall be posted for managing emergency transfusion services in the department. He/she will deal with all the emergency investigations in transfusion medicine.

  Training in research methodology:

  Training in research methodology shall be imparted by planning of a research project by the student under the guidance of a recognized guide to be executed and submitted in the form of a dissertation. The dissertation is aimed at training the candidate in research methods and techniques. It will include identification of a research question, formulation of a hypothesis, search and review of relevant literature, getting acquainted with recent advances, designing of research study, collection of data, critical analysis of the results and drawing conclusions. The topic shall be communicated to the university within six months of registration and atleast 12 months should be spent on the research project. The dissertation shall be completed and submitted by the student six months before appearing for the final university examination.

- # TEACHING EXPERIENCE:

  Student shall be actively involved in the teaching of undergraduate students / paramedical staff. He/she will be trained in teaching methods and use of audiovisual aids.

BROAD AREAS OF STUDY

History of Transfusion Medicine

- Scientific landmarks in its development
- Impact of world wars on its development
- Development of PVC bags

Scientific Basis of Transfusion

- **Biochemistry & Physiology of elements of blood**
  - Process of cell production and life span
    - Red cells
    - White blood cells
    - Platelets
  - Red cells
    - Hemoglobin structure & function
    - Metabolic pathways
    - Membrane structure & function

- White cells
    - Structure, function & kinetics
- Platelets
    - Structure, function & kinetics
- Physiology of Hemostasis
    - Role of platelets
    - Coagulation pathways
    - Fibrinolysis
- Hemodynamics of blood flow & volume
- Iron metabolism
- Bilirubin metabolism
- Immunology
    - Principles of Basic Immunology
    - Antigen, Antibody, Complement, Immunoglobulin
    - Antigen/antibody reaction
    - Lymphocytes in Humoral & Cellular immunity
- Role of Hybridoma technology in Immunology
- Immunology of transplantation
- HLA & genetic control of immune response
- Transfusion Immunology

- **Blood Group System**
    - Blood Group System
        - Major Blood Group System
        - Minor Blood Group System
- **Genetics**
    - Principles of basic genetics
    - Genetics of Blood Groups
        - Phenotypes & genotypes
        - Principles of blood group inheritance
        - Population genetics of blood groups
- **Molecular Biology**
    - Molecular Biology

- Molecular Biology of the cell
- Molecular Biology of the Gene
- Molecular Genetics

- **Microbiology**
  - Transmissible Diseases
  - Sterility Testing

- **Biochemistry**
  - Plasma Proteins – separation & purification
  - Immunoglobulins – estimation & typing

Antigen Systems in Formed Elements of Blood

- **Red Cell antigens including**
  - Lectins and their biology
  - Adsorption and Elution methods

- **Leucocyte antigens**
- **Platelet antigens**

Blood Collection, Processing, Component

Management of Blood Donation

- Donor recruitment
  - Voluntary blood donation system
  - Categories of blood donors
  - Education & awareness of prospective donors
  - Use of Information Technology for Donor Recruitment

- Acceptability criteria of blood donors
- Care of blood donors
  - Pre-donation
  - Mid-donation
  - Post-donation
  - Prevention & management of complications of blood donation

- Blood collection
    - Anticoagulants & preservatives
    - Procedure
    - Blood donation camps

- **Blood Components**
    - Components
        - Types
        - Methods of preparation
        - Indications, dosage & administration
        - Leuco-depletion
            - Various methods
            - Quality Control
    - Storage of blood & blood components
        - Whole blood
        - Red cell concentrate
        - Plasma
        - Granulocyte
        - Cryoprecipitate
        - Stem cells
            - Peripheral blood stem cells
            - Cord blood stem cells
    - Plasma fractionation
        - Viral inactivation
        - Newer methods

Pre-Transfusion Testing

- **Compatibility testing**
    - ABO grouping & Rh typing
    - Antibody screening
    - Methods of cross matching
    - Newer methods of cross matching
        - Solid Phase
        - Gel technology
    - Antiglobulin testing

- **Screening for Transfusion Transmitted Infections**
  - Methodology
  - Nucleic acid amplification techniques
  - Newer emerging pathogens
    - Prions
    - Lyme disease
    - Others
- **Selection of blood components & plasma products for transfusion**

- **CLINICAL ASPECTS OF IMMUNOHAEMATOLOGY & BLOOD TRANSFUSION**

Adverse Effects of Blood Transfusion

(Acute and delayed complications following Blood Transfusion)

- **Clinical presentation, pathophysiology, investigations, management**
  - Hemolytic transfusion reaction
  - Non hemolytic transfusion Reaction
- **Transfusion Transmitted Infections**
- **Transfusion Associated – Graft versus Host Disease (TA-GVHD)**
- **Transfusion Related Acute Lung Injury (TRALI)**
- **Others**
  - Haemosiderosis
  - Volume overload
  - Other complications

Apheresis

- **Haemapheresis (platelets, granulocytes, plasma)**
  - Donor selection
  - Procedure
  - Complications

- **Therapeutic apheresis**
    - Indications, procedure & complications
    - Plasma exchange, Red cell Exchange
    - Newer methods of Immunoadsorption

Autologous Transfusion

- **Basic principles, indications, contra-indications.**
    - Pre-deposit
    - Haemodilution
    - Intra-operative blood salvage including equipment
    - Directed donation

Antinatal & Neonatal Transfusion Practice

- **Pathophysiology, diagnosis & management**
    - Rh incompatibility
    - ABO & other blood group incompatibility

- **Exchange transfusion**
    - Indications, methodology & complications
    - Intrauterine transfusion
- **Neonatal transfusion practice**

Immunohematology

- **Classification, diagnosis and management**
    - Immune haemolytic anaemia
    - Immune thrombocytopenia
    - Immune neutropenia
- **Immunohaematological problems in multi-transfused patients**

Hemotherapy

- **Pathology, diagnosis and management of anaemia**
  - Anaemia
  - Iron deficiency anaemia
  - Megaloblastic anaemia
  - Aplastic anaemia
  - Haemolytic anaemia including fragmentation syndrome
  - Anaemia of chronic diseases – liver disease, uraemia, thyroid disease etc.

- **Haemoglobinopathies**
  - Thalassaemia
  - Sickle cell anaemia
  - Other haemoglobinopathies
- **Pathophysiology, diagnosis and management of haemostatic disorders**
  - Haemophilia
  - Von Willebrand disease
  - Platelet disorders
  - Qualitative disorders
  - Quantitative disorders
  - DIC

- **Pathophysiology, diagnosis and transfusion support in acute blood loss**
  - Shock
  - Massive transfusion

- **Transfusion support in cardiac surgery**
- **Classification & transfusion support in Oncology**
  - Leukaemia
  - Lymphoma
  - Marrow failure

Transplantation

- **Transfusion support in transplantation**
- **Peripheral blood stem cell transplantation**
    - Harvesting
    - Cryopreservation
    - CD34 counting

- **Bone Marrow Transplantation**
    - Processing
    - Harvesting
    - Immunopharmacological problems in ABO mismatched BMT

- **Bone Marrow Transplantation**
    - Renal transplantation
    - Liver transplantation
    - Umbilical cord blood transplantation
    - Collection
    - Processing
    - HLA typing & cross matching
    - Irradiation of blood products
    - Indications, dosage, adverse effects
    - Tissue banking

Blood Substitute & Hemopoietic Agents

- **Crystalloids & colloids**
- **Oxygen carrying compounds**
- **Haemopoietic growth factors**
- **Albumin**

Medico legal Considerations in Transfusion

- **Ethical & legal considerations pertaining to transfusion practice**
- **Identification of blood stains**

- **Paternity testing**
- **Donor notification and counselling**
- **Look back programme**

- **Drugs & Cosmetics Act**
- **Clinical, Legal and Ethical considerations in Organ Transplantation**

Total Quality Management

- **Development of Standard Operating Procedures (SOP) manual**
- **Quality control**
    - Reagents
    - Instruments
    - Personnel
    - Blood & Components

- **Quality Assurance**
    - Internal quality control
    - External quality control

- **Medical audit**
- **Hospital transfusion committee**
- **Good manufacturing practice**
- **Turnaround time**
- **ISO: 9000, Accreditation**

Organization & Management of Transfusion Services

- **Organization & function of blood services & hospital transfusion practice**
    - Donor recruitment & motivation
    - Operation of blood mobile units
    - Development of transfusion services
    - Inventory control
    - Development of forms, labels, records etc.

- Reports & Returns

- **National Blood Transfusion Policy**

Blood Safety

- **Sterilization**
- **Disposal of bio-hazardous material**

Modern Biological Techniques

- **Principles, methods, relevance in transfusion medicine**
  - Western blot
  - Polymerase chain reaction
  - SSCP
  - SSOP
  - Dot blot hybridization

Automation & Computerization

- **Automated blood grouping & processing**
- **Instrumentation & use of bar codes**
- **Use of computers in blood banking including implementation of blood banking software**

Cellular Therapies

Recent Advances in Immunohematology & Blood Transfusion